CLAIMS

What is claimed is:

1. A method for reducing thermal conductivity in thermal barrier coatings (TBC) through the incorporation of porosity comprising the steps of:

depositing a mixture comprising a TBC matrix and a fugitive material upon a part to form a layer; and

heating said layer at a temperature and for a duration sufficient to liberate a portion of said fugitive material to form a porous network.

2. The method of claim 1 wherein said depositing said TBC matrix comprises depositing a ceramic selected from the group consisting of 7YSZ, carbides, nitrides, silicides, and zirconium.

3. The method of claim 1 wherein said depositing said fugitive material comprises depositing a fugitive material selected from the group comprising carbon, molybdenum and tungsten.

4. The method of claim 1 wherein said depositing step comprises depositing said mixture comprising said TBC matrix and said fugitive material via an electron beam physical vapor deposition process (EB-PVD).

5. The method of claim 4 wherein said depositing said mixture via EB-PVD comprises utilizing particulate TBC matrix and particulate fugitive material.

6. The method of claim 4 wherein said depositing said mixture via EB-PVD comprises utilizing an ingot of said TBC matrix and an ingot of said fugitive material.

7. The method of claim 4 wherein said depositing said mixture via EB-PVD comprises utilizing a target comprised of an approximately uniform distribution of said TBC matrix and said fugitive material.

8. The method of claim 1 wherein said heating comprises heating said layer wherein said temperature is less than the melting temperature of the part.

9. The method of claim 1 wherein said heating comprises heating said layer wherein said temperature is less than the incipient melting point of the part.

10. The method of claim 1 wherein said heating comprises heating said layer wherein said temperature is between approximately 1750°F and 2100°F.

11. The method of claim 10 wherein said heating comprises heating said layer at a temperature and for a duration sufficient to liberate at least 90% of said fugitive material.

12. The method of claim 1 comprising the additional step of depositing at least one layer of a TBC mixture substantially free of any fugitive material.

13. The method of claim 1 wherein said depositing said mixture comprises the steps of alerting the rate at which said TBC matrix and said fugitive material is deposited to form said layer and heating said layer to produce a layer having a gradation of porosity.

14. The method of claim 1 wherein said heating comprises heating said layer to produce said porous network comprising a volume not greater than 40% of said layer by volume.

15. The method of claim 1 wherein said depositing step comprises depositing said mixture upon a gas turbine engine component.

16. A coating layer comprising:
a TBC matrix; and
a porous network extending through said TBC matrix.

17. The coating of claim 16 wherein said TBC matrix is selected from the group consisting of 7YSZ, carbides, nitrides, silicides, and zirconium.

18. The coating of claim 16 wherein said porous network has a volume not greater than 40% of said TBC matrix by volume.

19. The coating of claim 16 wherein said porous network is of a graded porosity.

20. The coating of claim 16 wherein said porous network is comprised of a plurality of pores each having a width between ten and one hundred nanometers.

21. A coated part comprising:
a part; and
at least one layer applied to said part comprising a TBC matrix and a porous network.

22. The coated part of claim 20 wherein said TBC matrix is selected from the group consisting of 7YSZ, carbides, nitrides, silicides, and zirconium.

23. The coated part of claim 21 wherein said porous network is of a graded porosity.

24. The coated part of claim 21 wherein said porous network is comprised of a plurality of pores each having a width between ten and one hundred nanometers.

25. The coated part of claim 21 wherein said porous network has a volume not greater than 40% of said TBC matrix by volume.